

WHAT IS CLAIMED IS:

sub A1
1. A group-III nitride semiconductor light-emitting diode comprising at least a first conduction-type single crystal substrate provided with a first conduction-type back-surface ohmic electrode on a back surface thereof, a buffer layer comprising a boron phosphide (BP)-based material on a front surface of said single crystal substrate, a gallium nitride (GaN)-based group-III nitride crystal layer having a light-emitting part of hetero-junction structure on said buffer layer, and a window layer comprising an electrically conducting transparent oxide crystal layer on said group-III nitride crystal layer, wherein at least a second conduction-type surface ohmic electrode conductive with said window layer is between the surface of said group-III nitride crystal layer and said window layer and comes into contact with the surface of said group-III nitride crystal layer and a pad electrode for wire bonding is on the center of the upper surface of said window layer.

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2. The group-III nitride semiconductor light-emitting diode as claimed in claim 1, wherein said second conduction-type surface ohmic electrode is disposed in a periphery of said pad electrode.

3. The group-III nitride semiconductor light-emitting diode as claimed in claim 1 or 2, wherein said second conduction-type surface ohmic electrode is disposed at a bilaterally symmetric position with respect to the center of said pad electrode.

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4. The group-III nitride semiconductor light-emitting diode as claimed in claim 1 or 2, wherein second conduction-type surface ohmic electrodes are disposed at isometric positions from the center of said pad electrode.

5. The group-III nitride semiconductor light-emitting diode as claimed in claim 1 or 2, wherein said second conduction-type surface ohmic electrode is composed of a plurality of electrodes disposed at equal intervals.

6. The group-III nitride semiconductor light-emitting diode as claimed

in claim 1 or 2, wherein said second conduction-type surface ohmic electrode is disposed in an open light-emitting region other than a projective region of the pad electrode on the surface of said group-III nitride crystal layer.

61 7. The group-III nitride semiconductor light-emitting diode as claimed in claim 6, wherein a sum of areas of second conduction-type surface ohmic electrodes is from 5 to 30% of a total area of the open light-emitting region.

8. The group-III nitride semiconductor light-emitting diode as claimed in claim 1 or 2, wherein the group-III nitride crystal layer in contact with said second conduction-type surface ohmic electrode comprises gallium phosphide nitride represented by $\text{GaN}_{1-x}\text{P}_x$ wherein $0 < x < 1$.

9. A light-emitting diode lamp comprising the group-III nitride semiconductor light-emitting diode claimed in claim 1 or 2, a mount lead and an inner lead.

10. A light source comprising the light-emitting diode lamp claimed in claim 9.

sub A3 11. An electrode for group-III nitride semiconductor light-emitting diodes for a group-III nitride semiconductor light-emitting diode comprising at least a gallium nitride (GaN)-based group-III nitride crystal layer having a light-emitting part of a hetero-junction structure, and a window layer comprising an electrically conducting transparent oxide crystal layer provided on said group-III nitride crystal layer, wherein at least a surface ohmic electrode conductive with said window layer is between the surface of said group-III nitride crystal layer and said window layer and comes into contact with the surface of said group-III nitride crystal layer and a pad electrode for wire bonding is on the center of the upper surface of said window layer.

sub C3 12. The electrode for group-III nitride semiconductor light-emitting diodes as claimed in claim 11, wherein said surface ohmic electrode is disposed at a position in a periphery of said pad electrode.

13. The electrode for group-III nitride semiconductor light-emitting diodes as claimed in claim 11 or 12, wherein said surface ohmic electrode is disposed at a bilaterally symmetric position with respect to the center of said pad electrode.

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14. The electrode for group-III nitride semiconductor light-emitting diodes as claimed in claim 11 or 12, wherein surface ohmic electrodes are disposed at isometric positions from the center of said pad electrode.

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15. The electrode for group-III nitride semiconductor light-emitting diodes as claimed in claim 11 or 12, wherein said surface ohmic electrode is composed of a plurality of electrodes disposed at equal intervals.

16. The electrode for group-III nitride semiconductor light-emitting diodes as claimed in claim 11 or 12, wherein said surface ohmic electrode is disposed in an open light-emitting region other than a projective region of the pad electrode on the surface of said group-III nitride crystal layer.

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17. The electrode for group-III nitride semiconductor light-emitting diodes as claimed in claim 16, wherein a sum of areas of said surface ohmic electrodes is from 5 to 30% of a total area of the open light-emitting region.

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18. The electrode for group-III nitride semiconductor light-emitting diodes as claimed in claim 11 or 12, wherein the group-III nitride crystal layer in contact with said surface ohmic electrode comprises gallium phosphide nitride represented by $\text{GaN}_{1-x}\text{P}_x$ wherein $0 < x < 1$.

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19. A method for producing an electrode for group-III nitride semiconductor light-emitting diodes, comprising

forming a surface ohmic electrode in contact with a surface of a gallium nitride (GaN)-based group-III nitride crystal layer having a light-emitting part of
s hetero-junction structure,

then covering the surface of said group-III nitride crystal layer and said surface ohmic electrode to form a window layer comprising an electrically

conducting transparent oxide crystal layer conductive with said surface ohmic electrode, and

then forming a pad electrode for wire bonding on a center of the upper surface of said window layer conductive with said window layer.

20. The method for producing an electrode for group-III nitride semiconductor light-emitting diodes as claimed in claim 19, wherein the pad electrode is formed on the group-III nitride crystal layer through a window layer comprising an electrically conducting transparent oxide crystal layer so that the electrically conducting transparent oxide crystal layer is not present on the surface of the pad electrode used for wire bonding.